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*Remarks on the cause of Epidemic Cholera with suggestions for its prevention in marching Regiments, By J. KELLIE, Surgeon 4th Bn. Artillery.*

I assume that the essential cause of Cholera resides in the atmosphere, but that it requires something in addition to this atmospheric agency to generate the disease, or rather to attract it from the air, and give it upon earth a local habitation.

The adjuvants to the invasion of cholera are, the congregation of large masses of people, the decomposition of animal and vegetable substances, imperfect ventilation, fatigue, exposure to vicissitudes of temperature, insufficient or unwholesome food; indeed, whatever debilitates, or deranges the system, acts as a predisposing cause to this disease, as it is a fact borne out by the most incontrovertible evidence in Europe, as well as in Asia, that cholera is generated amongst a people, and attracted and retained by them, in proportion as they are surrounded and affected by these predisposing causes.

During the prevalence of any epidemic, other diseases often disappear or become changed in their character, and assume the symptoms of the prevailing epidemic; thus, during the prevalence of plague, all other complaints have been known entirely to disappear; and on the invasion of cholera, other diseases are less frequent, and febrile, and dysenteric complaints have always a tendency to run into cholera; and it was remarked, when the sweating sickness raged in England, that other complaints assumed the sweating character; now, each of these instances, and many others might be adduced, clearly indicates the existence of a general pervading, morbid influence, and is not the less to be believed, because we are in ignorance of its source or nature.

But of whatever nature this atmospheric change may be, although we are unacquainted with its origin, and it is too widely diffused to be avoided, we nevertheless possess the power of neutralizing its baneful effects, and of rendering its operation comparatively innocuous; for by the adoption of an active system of health police, and the removal or avoidance of all those causes, which occasion a predisposition of the body to take on morbid action, we would in most instances effectually ward off an attack of cholera, and in others arrest its progress after it had appeared.

I do not believe cholera to be contagious under any circumstances, but I do believe that when the pestilence has once been attracted to a town or camp, the atmosphere becomes tainted, and all who come within its influence are liable to be attacked. Cholera is therefore in my opinion an infectious disease, but only so when the poison is rendered virulent by numbers, or where the predisposing influences abound: Its infectious power appears limited to the locality where it is prevailing, and is not carried to any distance by the wind, as miasmata in fever; and so feeble is its influence in single cases, that it may be said scarcely to exist, and a cholera patient may be brought from an infected spot into one where a pure atmosphere exists, with perfect safety; he will rarely communicate the disease to other persons even when subjected to the most intimate exposures. But, it becomes infectious in the mass, and it spreads by infection, whenever the poison is assisted in its operation, by the presence of those peculiar states which are acknowledged to predispose the body to disease.\*

Further, Cholera possesses the power of attaching itself to, and moving along with large bodies of individuals, and if the poison is not diluted by the dispersion of the infected body, and neutralized by its admixture with a purer atmosphere, the very air seems to become pregnant with this blight of human life, and the mortality most appalling. It adheres to the mass even when there is but little evidence of its existence in camp, accompanies it in its course, and disseminates the seeds of the pestilence along the line of march, and that too, amongst a portion of the community, who previous to the arrival of the infected body, seemed in perfect health, and who, under

\* The influence of predisposing causes in inviting an attack of cholera is well exemplified in fever, two diseases essentially different in their nature. On an attack of fever the patient feels cold, the blood forsakes the surface, and is collected in the internal organs, and if drawn from a vein, is black and unoxydized, thus, (as in partial poisoning by carbonic acid gas, from imperfect ventilation) some of the more prominent symptoms of cholera are already present, the first steps towards the pestilence have indeed been made, and the superaddition of the others, has been rendered comparatively easy, and hence it is, that during an epidemic constitution of the atmosphere, and during the stage of the disease we have supposed, that frequently the fever is arrested, and instead of reaction taking place, vomiting, purging &c. supervene. Here the action of the predisposing cause is well marked and distinctly traceable, but although, the effects of fever are more obvious than the other predisposing causes we have enumerated, in inducing an attack of cholera, it is not a whit more powerful in its injurious operation. A change is silently and gradually being effected in the human body, wherever these noxious agents exist, and the constitution is thus rendered peculiarly susceptible to choleric influence.

In the same way, when cholera is prevailing in camp, where all are mingled together, on the line of march, and all are more or less under its influence, a dose of neutral salts administered to any one will not unfrequently bring on an attack of the disease. In this instance we call into activity a disease which would have remained dormant in the constitution and would ultimately have been thrown off by the natural energies of the body. But it should be borne in mind that the same argument is equally applicable to fatigue, exposure to vicissitudes of temperature, unwholesome food, &c. they either directly invite an attack of the disease, or so reduce the natural power of the constitution, that it is unable to bear up against the morbid influences by which it is surrounded.

other circumstances would have been entirely exempt from its attack.\*

In towns, cholera uniformly in the first instance, selects for its victims the poor and miserable, and those who inhabit filthy and ill ventilated localities, and it afterwards extends its ravages to those portions of the town of an opposite character, and inhabited by a superior class, and in camps, the disease is attracted or generated amongst the followers, and its baneful influence is soon afterwards felt amongst the sepoys and officers.

If these premises are correct, and some experience in the disease leads me to believe in their truth, and if in connection with them we take into consideration the fatal character of cholera, the course which ought to be pursued is alike obvious and imperative. It is by prevention, rather than by cure, that cholera is to be overcome. Active sanitary measures should at once be resorted to, having especial reference to the removal of whatever tends to attract the disease, the avoidance as far as practicable of whatever predisposes the body to be influenced by morbid impressions, and on the first appearance of the pestilence, the adoption of every measure calculated to arrest its further progress.

With the above object in view, I now beg to suggest the following protective measures, and should they be apparently expensive, that expense will be amply repaid in the preservation of European life, the avoidance of pensions for shattered constitutions, and the prevention of that misery and pauperism which follow the death of the male members of families.

I have attached to each suggestion a note, containing some of the reasons on which it is grounded.

*Suggestion.—I.* To avoid notoriously infected roads and localities where the disease is liable to break out.

**NOTE.**—Cholera evidently affects some localities more than others, and there are in the Madras Presidency towns and localities where the disease is a frequent visitant, and where regiments are very liable to be attacked. This peculiarity arises from their position, existence of impurities, want of ventilation &c.; but has no reference to the geological structure of the country. The progress of the disease through Europe and America, with its subsequent disappearance there, is sufficient proof against its arising from geological influence. If it depended upon such a cause, and was immediately produced by exhalations from the earth, the habitation of the disease would be local and nearly permanent like ague, and would attack every town similarly circumstanced without reference to its size, purity or condition of its inhabitants. But such is not the character of this disease, for although there is scarcely a

\* Cholera attacked our troops during the late invasion of China when they were suffering from fatigue, exposure &c. and the disease extended its ravages amongst the inhabitants of the country, who had until then been unacquainted with it.

town or village in Southern India which has not suffered since the disease became prevalent in 1817, still the larger towns and those where the predisposing causes abound, are more frequently attacked, on such it will frequently descend and attach itself for months, and be fatal in its results, in proportion to the existence of impurities and want of ventilation.

This point is well borne out by a reference to the towns in Europe where the disease chiefly prevailed. In Great Britain those towns suffered most which were located on the banks of rivers, and those inhabitants whose houses were nearest to the river, and who were most exposed to dampness and to the effluvia from the decomposing matter, usually found in such situations, were carried off in great numbers; and if we look to the continent of Europe, and examine into the condition of the cities, where the pestilence raged with the greatest violence, we are furnished with abundant evidence of the powerful influence of local impurities &c. in attracting and retaining this disease.

WARSAW.      Cholera attacked the Capital of Poland during the rebellion. A walled town, crowded with the inhabitants of the surrounding country, the sick and wounded, and where all were suffering from anxiety, fatigue, and insufficiency of food.

BERLIN.      I believe without any exception the capital of Prussia to be the worst drained city in Europe, arising from the level nature of the surrounding country, all liquid impurities collect and stagnate in and about the town, producing a most offensive odour.

HAMBURG.      The old town of Hamburg, composed of narrow winding filthy streets and intersected by several stagnant canals, into which the impurities of the town were thrown, emitting a most offensive smell and looking the very abode of pestilence, suffered most severely.  
The other towns were Dantzie, St. Petersburg, Paris, London &c.

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*Suggestion 2.* Every corps on the line of march should have attached to it an additional medical officer and extra medical subordinates.

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*Note.*—Should Cholera appear in camp and the measure of breaking up corps as recommended into detachments be resorted to, these additional aids in the Medical department would be required, and under all circumstances their presence would produce confidence.

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*Suggestion 3.* Reliefs of corps should be less frequent, and the stations to which they are removed less remote, than those which are at present selected.

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Unless for political reasons no regiment should be marched beyond the nearest station.

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*Note.*—Long marches harass the soldier and expose him to every morbid influence, increase the expenditure of the sepoy beyond his means, and oblige him and his family to resort to an inferior and less nourishing diet, one of the principal predisposing causes to cholera when taken in connection with fatigue.

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*Suggestion 4.* European and native regiments on the line of march should be unattended by families; and followers extra to the establishment should be strictly prohibited.

In the periodical movement of corps, more especially when passing through districts where the disease is liable to occur, the regiment should be broken up into detachments. No detachment to exceed two companies, and to be separate from each other by at least one day's journey. Safety on the line of march appears in a great measure to reside in the smallness of, the marching body, and more especially keeping from the encampment all followers who are not directly connected with the regiment, as the classes alluded to, are always poor, filthy in their habits and entirely exposed to the varying effects of the weather, and thus, more disposed than the soldier to attract disease.

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Note.—A regiment on the line of march may be in the highest order, and the most persevering attention may be devoted to its internal economy, and the preservation of the health of the men; but as long as the camp contains five followers to every fighting man, and many of them in a state of great destitution so long will the regiment carry along with it, the germ of its destruction. Experience teaches us, that the larger the bodies of individuals, particularly when suffering from the fatigue and exposure unavoidable on a march, the more liable is it, under peculiar states of the atmosphere to be attacked by cholera; The immunity enjoyed by our Artillery and Escort detachments by the Bengal and Bombay troops, who move without household incumbrances, bears out the propriety of the measure recommended; and I may also instance the Nizam's troops who rarely suffer from cholera, and which is to be attributed in a great measure to the shortness of their journeys, the custom of sending on the families in advance, and also to the circumstance of many of these sepoys having left their families in their native country, the North West provinces of Bengal.

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*Suggestion 5.* On the first appearance of cholera in a large body of troops, or in a regiment on the line of march, the most active measures should be resorted to with the view of extinguishing the disease; the affected body should be immediately broken up into as many detached parties as circumstances will admit of, and separated to some distance from each other; fatigue and unnecessary exposure should be scrupulously avoided. The number of men on guard should be reduced, and relieved morning and evening, and sentries every hour. No tent should be permitted to be struck until the sounding of the first bugle, on no occasion should the men be detained unnecessarily on the parade ground, but formed and marched off at once, and the regiment should endeavour to reach the encamping ground before 7 o'clock in the hot weather. The route should be changed if deemed necessary and the new one pursued by easy stages; on no occasion should the regiment halt even for a day, but ought to move onwards however short the distance into clean ground and a purer atmosphere.

The men should be encouraged to prepare warm pepper water or congee to be taken before marching.

Note.—As certainly as cholera is in many instances induced by the congregation of large bodies of men, so will the converse be found to hold true. The disease which was generated by the assemblage will be destroyed by their separation, and the scourge would be arrested by the adoption of those means of precaution, which are acknowledged to protect the frame against injurious impressions ; the disease would thus be nipped in the bud, instead of pursuing for an indefinite period, as it hitherto has done, its desolating career.

Cholera is a usual attendant at native festivals, where crowds of people are collected. At Juggernaut it is an annual visitant. The town of Pooree contains 35000 inhabitants and the number of pilgrims sometimes amounts to 150,000. The inhabitants are usually quite healthy before the occurrence of the festival which takes place in June or July, but immediately on the arrival of the pilgrims, and when the lodging houses are literally crammed with inmates, cholera suddenly breaks out, and in the space of a few days, hundreds are cut off by it. This is not an occasional or accidental occurrence, it is an invariable one, and the disease which had thus been generated, as suddenly disappears, on the dispersion of the crowd, a few isolated cases only occurring for two or three days after the departure of the pilgrims, (Letter from Dr. Cumberland, Pooree.)

*Suggestion 6.* The Camp should be pitched on elevated, open, and dry ground, at some distance from, and to windward of the town, and spread over a considerable space, so as to admit of the most perfect ventilation, and cleanliness within the camp, having especial reference to the bazaar ; and that portion where the followers are congregated, should be carefully attended to.

Banks of rivers, water courses and confined localities, such as are found in the vicinity of hills and at the foot of ghauts should be scrupulously avoided.

Note.—Cholera evidently shows a strong predilection for the banks of rivers, arising from their filthy condition, produced by fluvial deposits, from the stagnant pools, and the decomposing animal and vegetable remains which are usually found in their neighbourhood. This circumstance has long been remarked in India, from Cholera often pursuing the course of rivers, and in Bengal attacking with the greatest virulence troops proceeding in boats by the river route, and the same circumstance has been observed in Great Britain, when the disease prevailed there. In the towns of Sunderland, Dundee, Inverness, Haddington, Musselburgh, Dumfries, &c. the disease raged with the greatest violence, and their positions are low and damp, and on the banks of rivers, and it was also particularly observed, that that portion of the inhabitants whose houses were nearest to the river, suffered most severely ; there the disease was not only more frequent, but the mortality was much greater.

*Suggestion 7.* The number of Tents supplied for the accommodation of both European and native troops when in encampment, has always appeared to me quite inadequate for that purpose. The heat from their

crowded condition is excessive, and the air soon becomes thoroughly vitiated, a state of matters at all times prejudicial to health, but when attended by a choleric state of the atmosphere, cannot fail to be in the highest degree predisposing to its attack.

In wet weather the floor of the tent should be covered with a tarpauling, as there is no more powerful exciting cause of bowel complaints, than after exposure to great heat during the day, lying on the cold damp ground all night.

At present on the line of march, married men of native corps, occupy tents of their own, along with their families. In the event therefore of the families being separated from the regiment, additional government accommodation would become absolutely necessary.

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Note.—In a perfectly still atmosphere as is often observed in India, and where the air is much rarified by heat, numbers of people cannot be collected within circumscribed limits with safety, the oxygen of the air, on which life depends, is rapidly absorbed, and its place supplied by the exhaled carbonic acid gas, which is again inhaled to the immediate injury of the powers of life, vitiating the blood, and which in its black unoxydized state, is circulated through the whole system, producing a condition of the body analogous to the first stage of cholera, viz drowsiness, coldness of the body, copious perspiration, vomiting &c. and if the patient is not actively treated he dies of asphyxia, the immediate cause of death in Cholera. No one can doubt, that imperfect ventilation, the absence of a due proportion of oxygen in the atmosphere and superabundance of carbonic acid gas, must facilitate an attack of the disease we are considering, indeed as above stated, several of the more prominent symptoms of cholera are immediately produced by it, and the superaddition of the others has been rendered comparatively easy, hence, the disease commits its greatest ravages in crowded ill ventilated barracks, bazaars, densely populated towns, particularly such as are surrounded by walls, preventing the ingress of pure air; and in that portion of them, where, carbonic acid gas, is by the decomposition of animal and vegetable refuse, being evolved, crowded school rooms, the inhabitants of a portion of a barrack in the vicinity of an open drain, native huts into which there is but one opening and that closed at night, whole families are frequently swept away from their exposure to this exciting cause.

But when Cholera appears in a family occupying a superior station in life, and in whose houses pure air always exists, the disease is almost invariably confined to the individual first attacked, and which in most instances is to be attributed to an accidental exposure to a poisoned atmosphere, beyond the walls of his own dwelling.

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In conclusion I would respectfully submit for the consideration of the constituted authorities the propriety of rendering a medical officer in charge of a regiment in a cholera camp completely independant, all measures having for their object the preservation of the lives of the soldiers, should emanate from him, and be scrupulously attended to, no

interference with any arrangement he may deem necessary should be permitted. The Surgeon should be responsible alone to the dictates of his own conscience and the respect due to the opinion of his Medical superiors.

Prophylactic measures in camp as well as in garrison have too long been considered of secondary importance, and a medical officer's duty has hitherto been almost entirely confined to the curing of disease, seldom indeed exerted for its prevention, and with what results our Bills of mortality too clearly show. In the present instance the object is one fraught with deep and awful import, for during a period of 27 years, the Company's possessions have been desolated by this mighty epidemic; from every family it has selected its victim and more of our soldiers have fallen by its ravages than by the swords of our enemies. Philanthropy and Science have gone hand in hand to stay its progress, and our best efforts have only exhibited the impotency of human skill. If therefore we cannot cure the disease, let us at all events adopt such preventive measures as may be within our reach. The wisest policy and best feelings of humanity call upon us for exertion, and if this but imperfect sketch should awaken enquiry or in any way contribute to so desirable an end, the object of its writer will be most satisfactorily accomplished.

ST. THOMAS'S MOUNT, *July* 1844.